

CLAIMS

What is claimed is:

1. A longitudinally extending foot keel for a prosthetic foot, the foot keel comprising:

posterior and anterior plantar surface weight bearing areas and a non-weight bearing arch shaped midportion extending between the weight bearing areas,

wherein the midportion is formed with a spring which is compressed to absorb and expanded to return vertical load during use of the foot keel in a prosthetic foot.
2. The foot keel according to claim 1, wherein the posterior end of the arch shaped midportion is a coiled downwardly and anteriorly to form the spring.
3. The foot keel according to claim 1, wherein the posterior plantar surface weight bearing area of the foot keel is connected to the arch shaped midportion by way of the spring.
4. The foot keel according to claim 1, wherein the arch shaped midportion extends continuously to the anterior plantar surface weight bearing area of the foot keel.
5. The foot keel according to claim 1, further comprising an attachment fitting mounted on a dorsal surface of the posterior end of the arch shaped midportion for

connecting the foot keel to a supporting structure attached to a leg stump of a person.

6. The foot keel according to claim 1, wherein each of the posterior and anterior plantar surface weight bearing areas of the foot keel are upward concavely curved.

7. The foot keel according to claim 1, wherein said midportion is upward convexly curved over its entire longitudinal extent from the anterior plantar surface weight bearing area to the posterior end of the arch shaped midportion, the midportion posterior end being coiled downwardly and anteriorly to form the spring.

8. The foot keel according to claim 1, further comprising a fastening arrangement on a dorsal, posterior surface of the midportion for connecting the lower end of a calf shank to the foot keel.

9. The foot keel according to claim 8, wherein the longitudinal position of the fastening arrangement on the arch shaped midportion is adjustable.

10. The foot keel according to claim 1, wherein a dorsal aspect of said midportion and anterior weight bearing area is formed with an upwardly facing concavity, said concavity having a longitudinal axis which is oriented parallel to the frontal plane of the foot keel.

11. The foot keel according to claim 1, wherein the anterior end of said anterior weight bearing area is shaped in an upwardly curved arc to simulate the human toes being dorsiflexed in the heel rise toe off position of the late stance phase of gait.

12. The foot keel according to claim 1, wherein the posterior end of the posterior weight bearing area is shaped in an upwardly curved arc that reacts to ground reaction forces during heel strike by compressing for shock absorption.

13. The foot keel according to claim 1, wherein the anterior of the posterior weight bearing area includes an expansion joint hole extending through said foot keel between dorsal and plantar surfaces thereof with an expansion joint extending posteriorly from said expansion joint hole to the posterior edge of the foot keel to form plural expansion struts which create improved biplanar motion capability of the posterior weight bearing area in a prosthetic foot in gait.

14. A prosthetic foot comprising:

a longitudinally extending foot keel including posterior and anterior plantar surface weight bearing areas and a non-weight bearing arch shaped midportion extending between the weight bearing areas,

wherein the midportion is formed with a spring which is compressed to absorb and expanded to return vertical load during use of the prosthetic foot.

15. The prosthetic foot according to claim 14, further comprising a resilient, upstanding calf shank having a downward, anteriorly facing convexly curved lower end coupled to the foot keel to form an ankle joint area of the prosthetic foot, the calf shank extending upward to form a lower, prosthetic part of a leg above the ankle joint area for connection with a supporting structure on a person's leg stump.

16. The prosthetic foot according to claim 15, wherein the calf shank above the ankle joint area is also anteriorly facing convexly curved.

17. The prosthetic foot according to claim 15, further comprising a fastening arrangement coupling the calf shank to the foot keel, the fastening arrangement being adjustable to permit adjustment of the alignment of the calf shank and foot keel with respect to one another is the longitudinal direction of the foot keel.

18. The prosthetic foot according to claim 15, further comprising a fastening arrangement coupling the calf shank to the foot keel, the fastening arrangement including means for adjusting the inclination at which the calf shank is coupled to the foot keel is the longitudinal direction of the foot keel.

19. The prosthetic foot according to claim 15, wherein the calf shank forming the lower, prosthetic part of a leg extends upward in a substantially curvilinear manner

so as to be expandable and compressible in response to ground reaction forces therein during gait for storing and releasing energy to improve dynamic response of the prosthetic foot in gait.

20. The prosthetic foot according to claim 14, wherein the posterior end of the arch shaped midportion is coiled downwardly and anteriorly to form the spring.

21. The prosthetic foot according to claim 14, wherein the posterior plantar weight bearing area of the foot keel is connected to the arch shaped midportion by way of the spring.

22. The prosthetic foot according to claim 14, wherein the arch shaped midportion extends continuously to the anterior plantar surface weight bearing area of the foot keel.

23. The prosthetic foot according to claim 14, further comprising a coupling element mounted on a dorsal surface of the posterior end of the arch shaped midportion for connecting the foot to a supporting structure attached to a leg stump of a person.

24. The prosthetic foot according to claim 14, wherein each of the posterior and anterior plantar surface weight bearing areas of the foot keel are upward concavely curved.

25. A method of absorbing and returning vertical load in a prosthetic foot during varied activities, wherein the prosthetic foot has a foot keel with posterior and anterior plantar surface weight bearing areas and a non-weight bearing arch shaped midportion extending between the weight bearing areas, the midportion at its posterior end being formed into a coil spring, the method including:

elastically loading the arch shaped midportion by expansion and the coil spring of the midportion by compression in response to vertically directed forces on the prosthetic foot, and

returning energy stored by the midportion upon lowering the vertically directed forces on the prosthetic foot.

26. The method according to claim 25, wherein each of said posterior and anterior plantar surface weight bearing areas of the foot keel are upward concavely curved, and wherein the method further comprises absorbing and returning vertical load upon heel-toe ground contact of the prosthetic foot in gait by the respective compression and expansion of the curvatures of the weight-bearing areas of the foot keel.